

Development of eco-friendly alternatives to the omnipresent plastic material and The current status of Environmental sound technology development in Mexico

Green Technology Marketplace 2023

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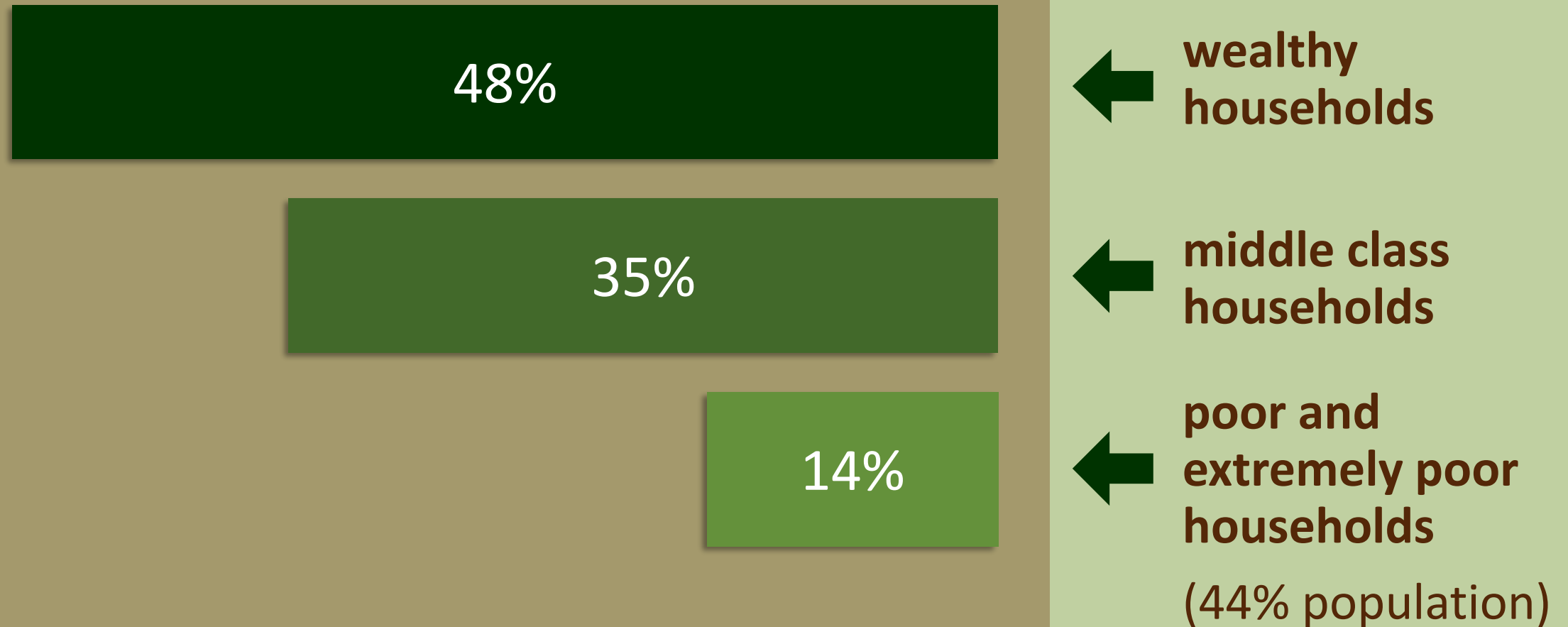
México

A large crowd of people, mostly young adults, is gathered outdoors, likely at a festival or concert. They are wearing casual clothing and many are wearing sunglasses, suggesting a sunny day. The crowd is dense and fills the entire frame.

+130 millions of people in Mexico (WIPO, 2021)

20% of the richest families concentrate half of the wealth

% of wealth concentrated in Mexican households by socioeconomic level



Households 35mill.

40% people are poor



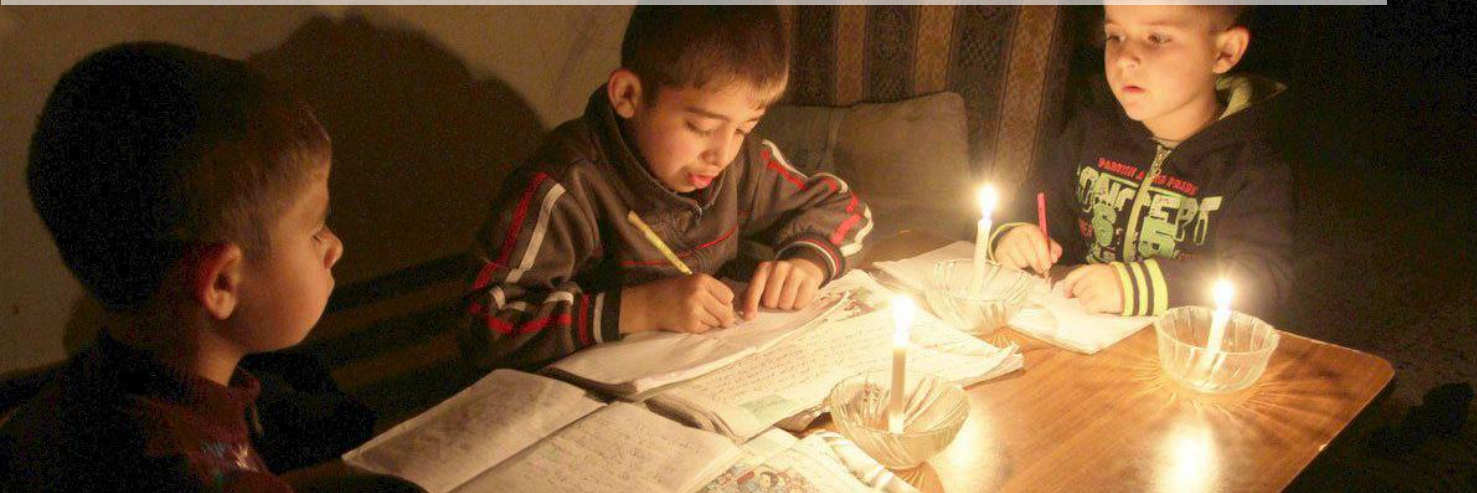
Lack of access to health care services

16.2%(2018) to 28.2%(2020)

(Coneval, 2020)

Lack of access to housing services

19.6%(2018) to 17.9%(2020)





For everyone

Temperature will have risen 3.5°C by 2100

Dominant Technological and Innovation System



Industry and
companies
Market



\$
Research
Science



High Technology
Technological
development
(Production)



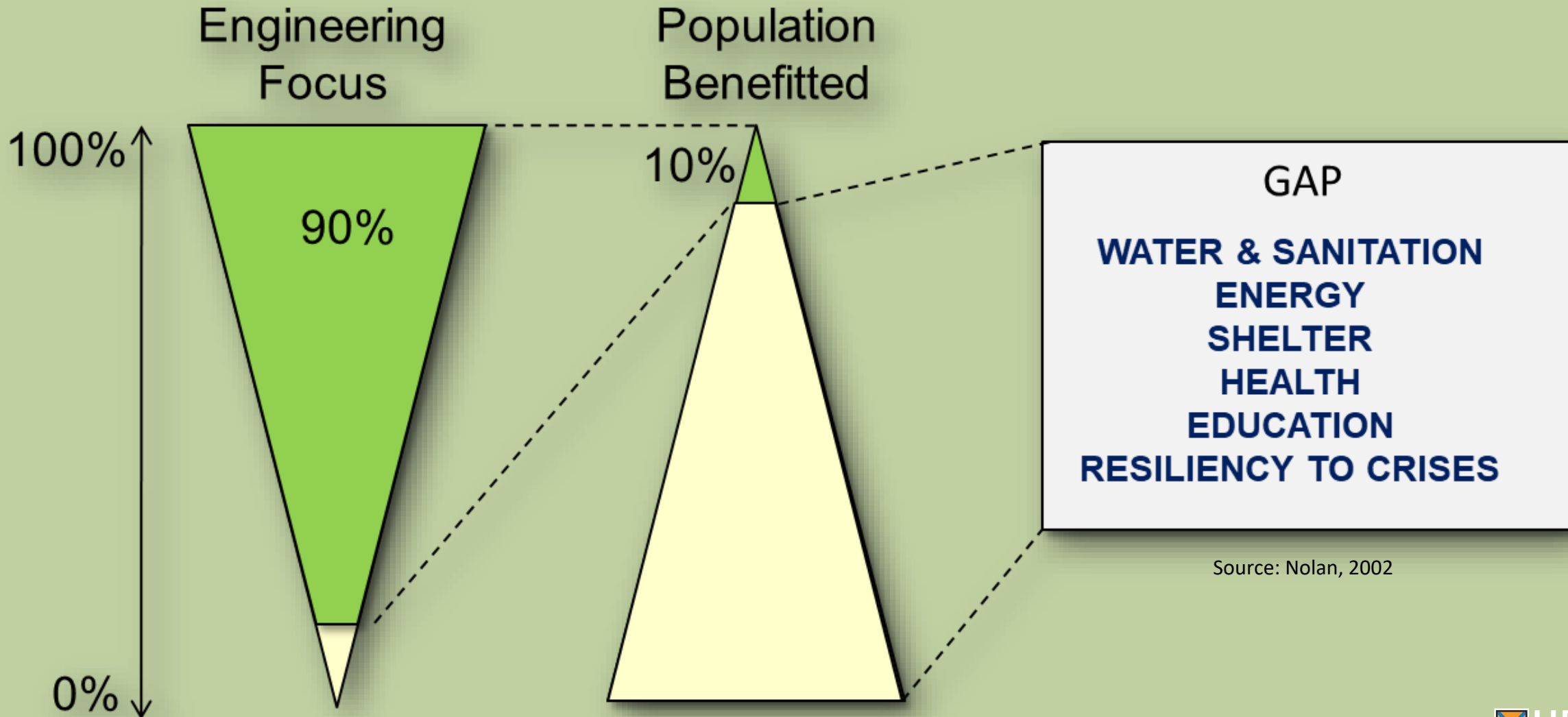
Innovation
Commercialization



\$
Business
models
Entrepreneurship

Profitable goals

A large gap remains between today's technological advances and the needs of the world's majority



What the wealthy households need?

What the rest of the people need?

Alternative Technological and Innovation System



Social issues
(community
resources,
strengths)



Sustainable
Development
Goals (SDG's)
Agenda 2030



Research
Science



Technological
development
Appropriate
technology
ad-hoc



Social/Frugal
Innovation



Social/Frugal
Entrepreneurship

Social Goals

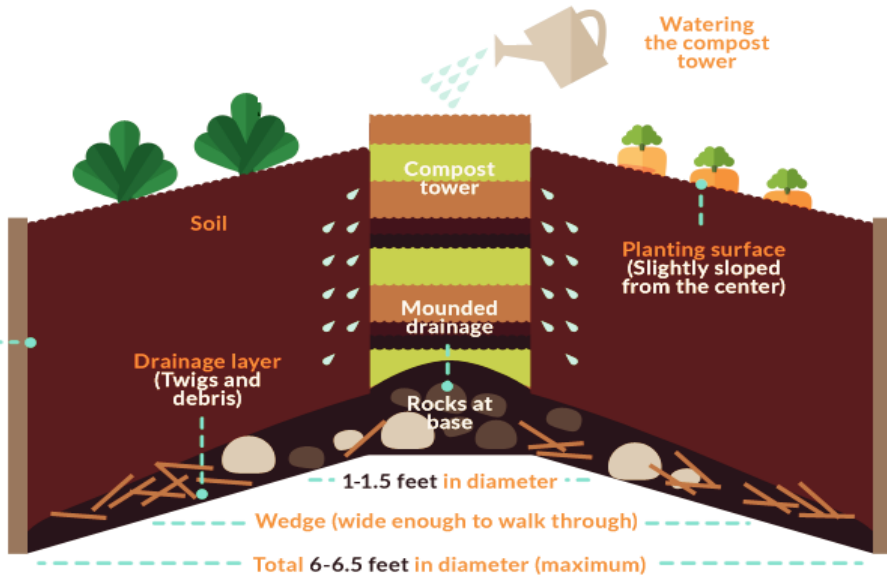
A stylized, light green outline of the map of Mexico is positioned in the background, centered behind the main text.

**Could the people of México be a
marketplace for green technology?**

A pair of hands holds a white rectangular sign with the word "YES!" written in large, bold, black capital letters. The sign is held up against a bright blue sky with scattered white clouds. The hands are positioned on the left and right sides of the sign, with fingers gripping the edges. The sign has a slightly wavy top edge.

YES!

The **ANATOMY** of a KEYHOLE GARDEN



Humanitarian Engineering



**Appropriate
Green Technology**



Nido de Lluvia,
sistema de captación de agua

(Rain nest, water catchment system)



1 Lluve



2 Cae al captador



3 Se filtra y se limpia



4 Y está lista para lavar ropa, platos o cualquier uso doméstico



Source:
https://www.mural.com.mx/aplicacioneslibre/preacceso/articulo/default.aspx?__rval=1&urlredirect=https://www.mural.com.mx/suman-286-casas-con-nido-de-lluvia/ar2233350?referer=7d616165662f3a3a6262623b727a7a7279703b767a783a--

Companies in México



Companies in México, 2022		5.5 mill		
Micro business	Source: INEGI,2022	95%	19.8%	17.2%
Small business		4%	84.6%	81.2%
Medium		0.8%	95.6%	91.1%
Big business		0.2%		
Companies that carried out Research and Technological Development activities		3.8%		

Source: www.inegi.org.mx/contenidos/saladeprensa/aproposito/2020/MYPIMES20.pdf

Jalisco, 2020-21	
In Jalisco (third place)	378,068

Source: INEGI,2022

“20% have sustainable practices,
the majority of **large companies**”

(Navarrete Báez, F. E. ,2022)

Intellectual Property in México

México, 2021	
In effect	117,170
Patent application	17037
From residents, in Mexico and abroad	➡ 1993
Granted	11058
Application for utility model	721
From residents, in Mexico and abroad	642

Source: WIPO, 2021

Jalisco, 2020-21	
In effect	117,170
Patent application	227

Source: El economista



Traditional Models

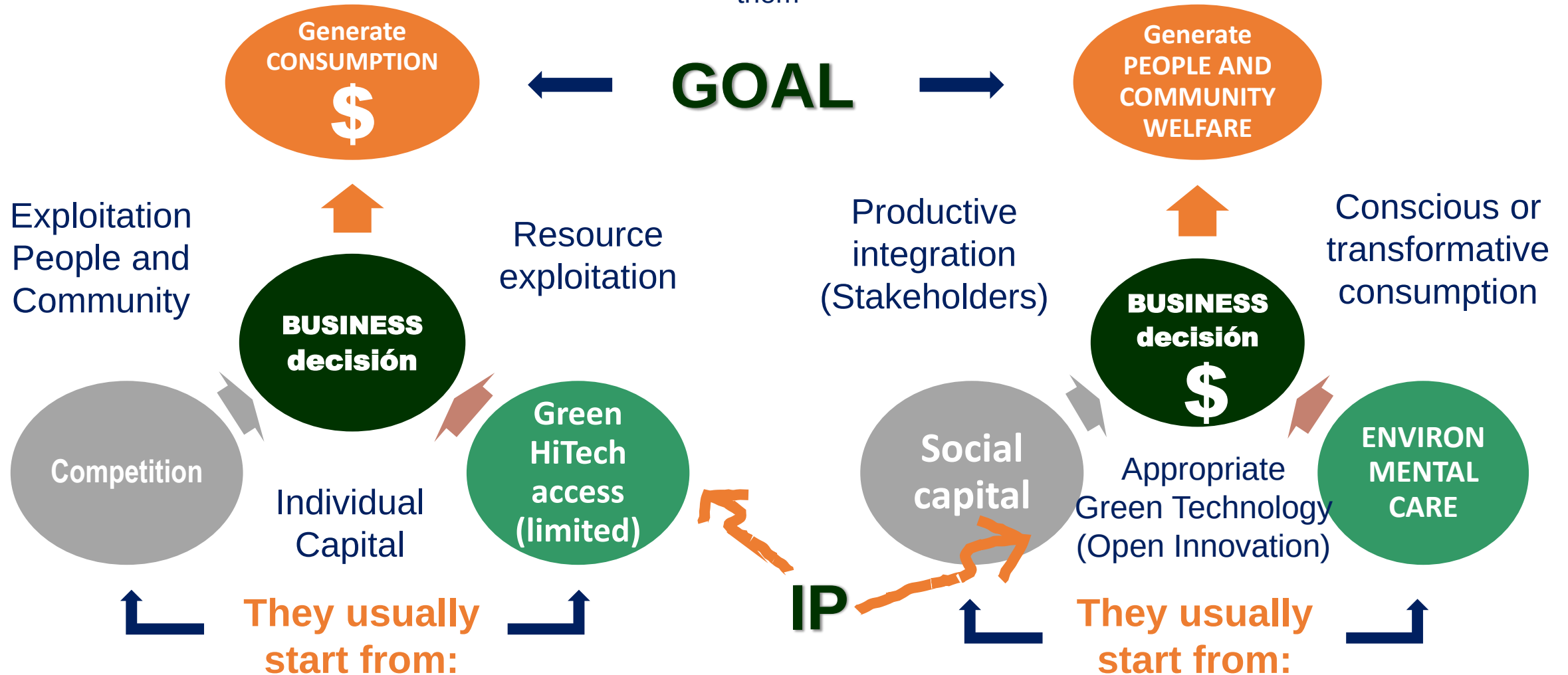


If you flip your priorities and vision, profits flow, not chase them



Innovative Models

GOAL



Case:

Pellets of Cactus Bioplastic

Product Development Process

300 Each year
millions tons
Of plastics



**weight of the entire
human population**



13 millions tons
go to the ocean



Source: ONU Ambiente, 2018

Source: ONU, 2019

= **55** Manhattan islands



Up to 80% of marine debris are plastic | **Up to 21** millions tons are **micro-plastics** at the bottom of the sea



and we consume them daily

Source: Greenpeace, 2016



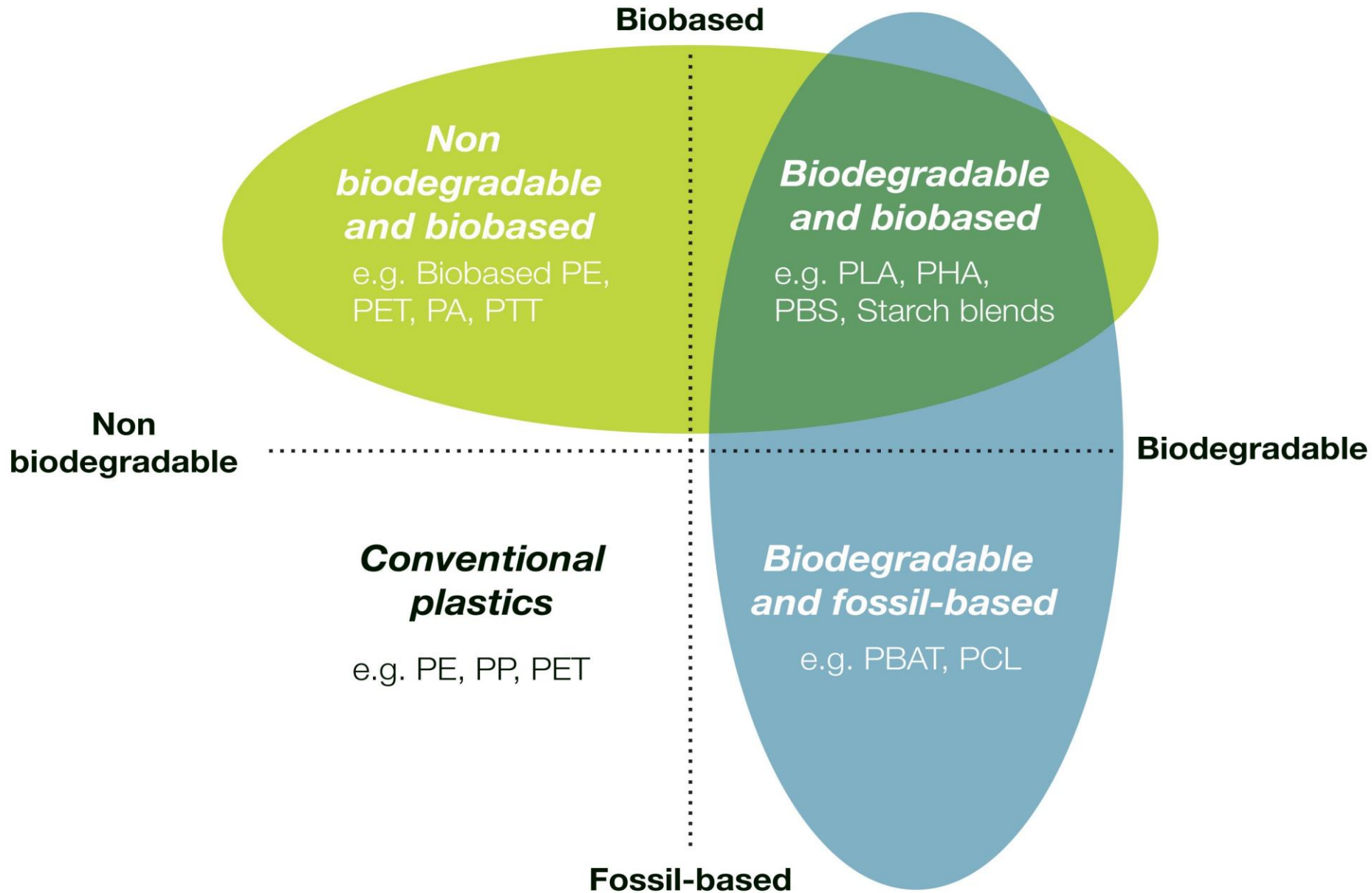
Source: CSIRO citado por La Vanguardia, 2020

¿did you know...?

Some of the biodegradable plastics **THEY ARE NOT!**



they keep polluting



bio ≠



¿ How to protect the consumer?



generate
TRUST

NMX-E-273-NYCE-2019

Plastic Industry-Compostable Plastics

↑
Target



CACTUS



+300 species
140 in
México

- food, dyes
- hydrocolloids, paints
- bioenergy, fertilizers
- cosmetics,
- biopolymers

Variable
Composición
(species and
maturity
grade)

- 60 – 95 % water
- 11.5 % sugars
- 1.55 % proteins
- 3.12 % pectins
- 0.16 % lipids

Mucilage

- Complex polysaccharide
- Viscous colloid in water
- Biodegradable
- Arabinose, galactose, galacturonic acid, rhamnose and xylose

Solution: Green Technology



**SDG's to which
the solution
contributes**



Scientific and technological development process





Formula from nopal and other natural inputs to produce thermoplastic biopolymer pellets.

Thermoplastic biopolymer pellets, elastic, low resistance, flexible, non-toxic, water-soluble, biodegradable in compost in 7 days and in soil in 45 days maximum.

Biodegradable in compost in 7 days and in soil in 45 days maximum.

Use of **inedible nopal**, as in other bioplastics made from corn, potato or avocado.



Para diversas aplicaciones

sin contacto directo, continuo, por periodos largos, con líquidos.



Market overview



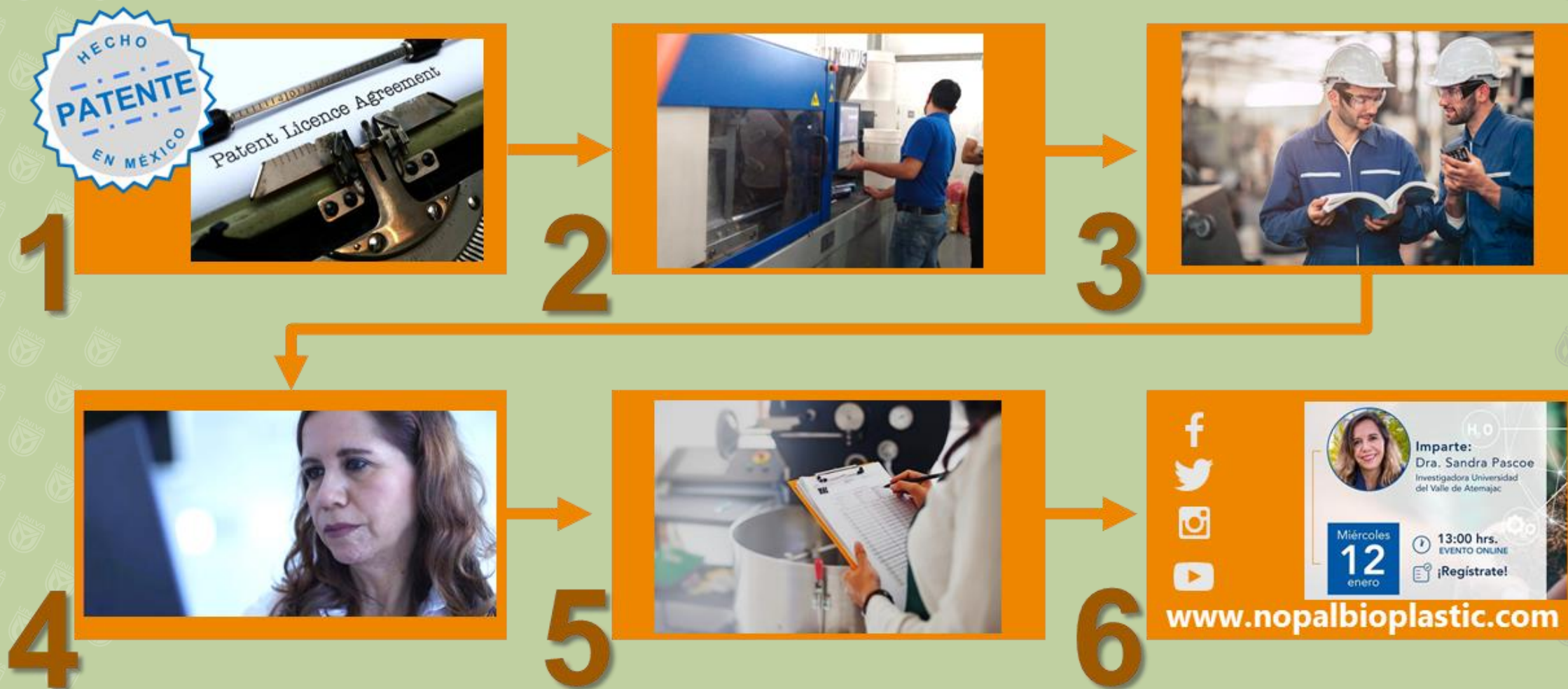
48% of bioplastics market (2021) ➡ production of packaging.

Global bioplastics industry is aiming to supply 2% of the world's demand for plastic raw materials by 2026.



- Regulations, certifications and **BUYER EDUCATION** are critical
- The availability of **cheaper alternatives** is likely to hinder the growth of this market.

Technological package



Next steps

Call of the Ministry of Innovation, Science and Technology of the State of Jalisco

"From Science to Market"

Sectors of Application/Impact:

- Food
- Environmental
- Rehabilitation Devices
- Health
- Industrial
- Pharmaceutical Systems



COECYTJAL
Consejo Estatal de Ciencia
y Tecnología de Jalisco



**Innovación, Ciencia
y Tecnología**



Jalisco
GOBIERNO DEL ESTADO

Modality A



COECYTJAL
Consejo Estatal de Ciencia
y Tecnología de Jalisco



Innovación, Ciencia
y Tecnología



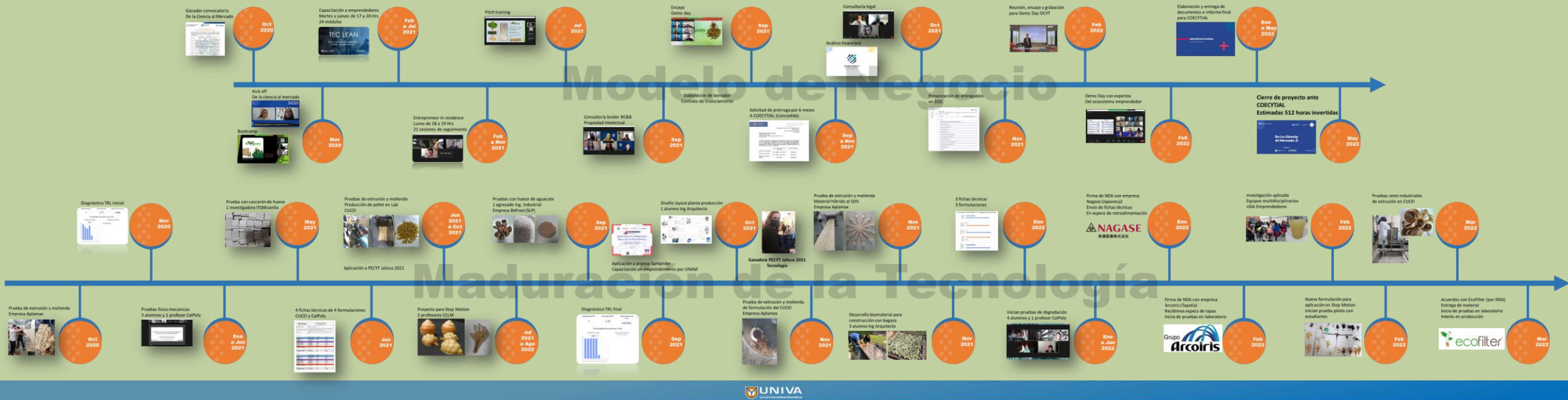
Scientific-technological projects coming from patents with opportunities to mature into technological products, for the detection and promotion of business opportunities through **COMPANY BUILDER**



Main characteristics:

- Phases at laboratory **TRL 3-5**
- Present **basic evidence of scaling potential**
- To present the characteristics of at least one **minimum viable product (MVP)**

IRL: Investment Readiness Level



➔ **TRL: Technology Readiness Levels**

Extrusion and grinding tests



**Oct
2020**

Technical specifications

	Universidad del Valle de Atemajac FICHA TÉCNICA BIOPLÁSTICO DE NOPAL <i>Opuntia velutina</i>
Nombre del material	Bioplástico de Jugo de Nopal
Descripción general del material	Es un biopolímero termoplástico, no tóxico, soluble en agua, biodegradable en composta en 7 días, y en suelo en 45 días máximo.
Función o uso	Producción de pellets, láminas y películas, piezas producidas por vaciado en moldes.

Fórmula 1.

	Método de prueba	Unidad	Valor
Propiedades físicas			
Densidad	NMX-004-CNCP-2004	g/cm ³	0.922
Absorción de agua	ASTM D570-2005	%	165 - 225
Solubilidad	No normado	%	13
Propiedades mecánicas			
Resistencia a la tensión	ASTM D882-02	MPa	2.26
Módulo de Young	ASTM D882-02	MPa	11.36
Elongación a la rotura	ASTM D882-02	%	115.97
Dureza	ASTM D2240	Shore D	8.5
Propiedades térmicas			
Temperatura de degradación	ASTM E2105 -00	° C	136
Temperatura de transición vítrea	ASTM D3418-15	° C	43.4
Temperatura de fusión	ASTM D3418-15	° C	56.31

Fórmula 2.

	Método de prueba	Unidad	Valor
Propiedades físicas			
Densidad	NMX-004-CNCP-2004	g/cm ³	1.05
Absorción de agua	ASTM D570-2005	%	85 -140
Solubilidad	No normado	%	14
Propiedades mecánicas			
Resistencia a la tensión	ASTM D882-02	MPa	0.96
Módulo de Young	ASTM D882-02	MPa	2.96
Elongación a la rotura	ASTM D882-02	%	188.27
Dureza	ASTM D2240	Shore D	5
Propiedades térmicas			
Temperatura de degradación	ASTM E2105 -00	° C	127
Temperatura de transición vítrea	ASTM D3418-15	° C	43.99
Temperatura de fusión	ASTM D3418-15	° C	51.89

Jun
2021

Extrusion and grinding tests Pellet production



**Jun
2021
a Oct
2021**

Testing of hybrid material in company

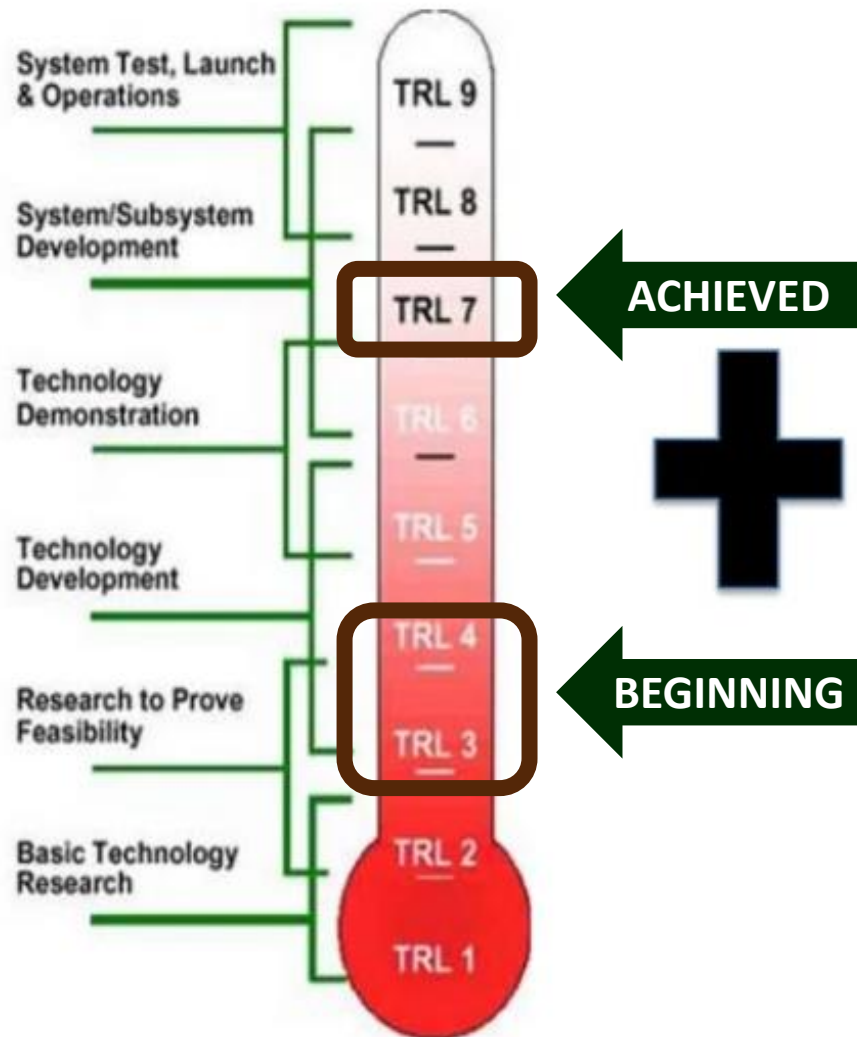


**Nov
2021**

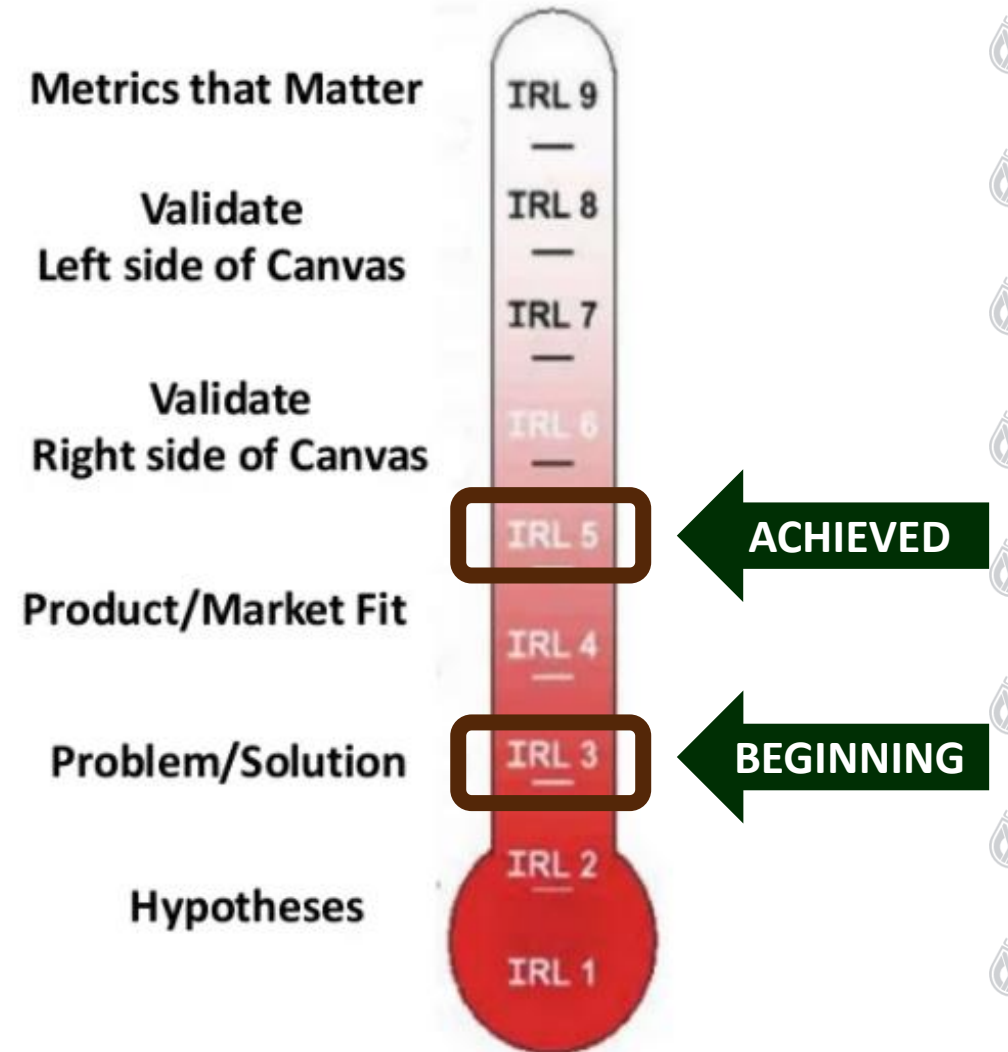
Semi-industrial testing



Technology Readiness Level



Investment Readiness Level



Science-technology based Entrepreneurship

Scientific Research, Tecnological Development & Innovation UNIVA



Trademark Registration

Development of logo and registration in "IMPI"



Valuation Technology

Contracting of a certified technology transfer office



New Product Development with companies

NDA with companies Reformulations and new formulations for specific applications



Semi-Industrial Testing

Collaborative work Universities Government



Industrial Testing

Collaborative work: Companies Government



SUSTAINABLE BUSINESS MODEL

CANVAS



TRANSFER OF TECHNOLOGY LICENSING

License agreement for the delivery of the technology package



Entrepreneurship

UNIVA receives royalties

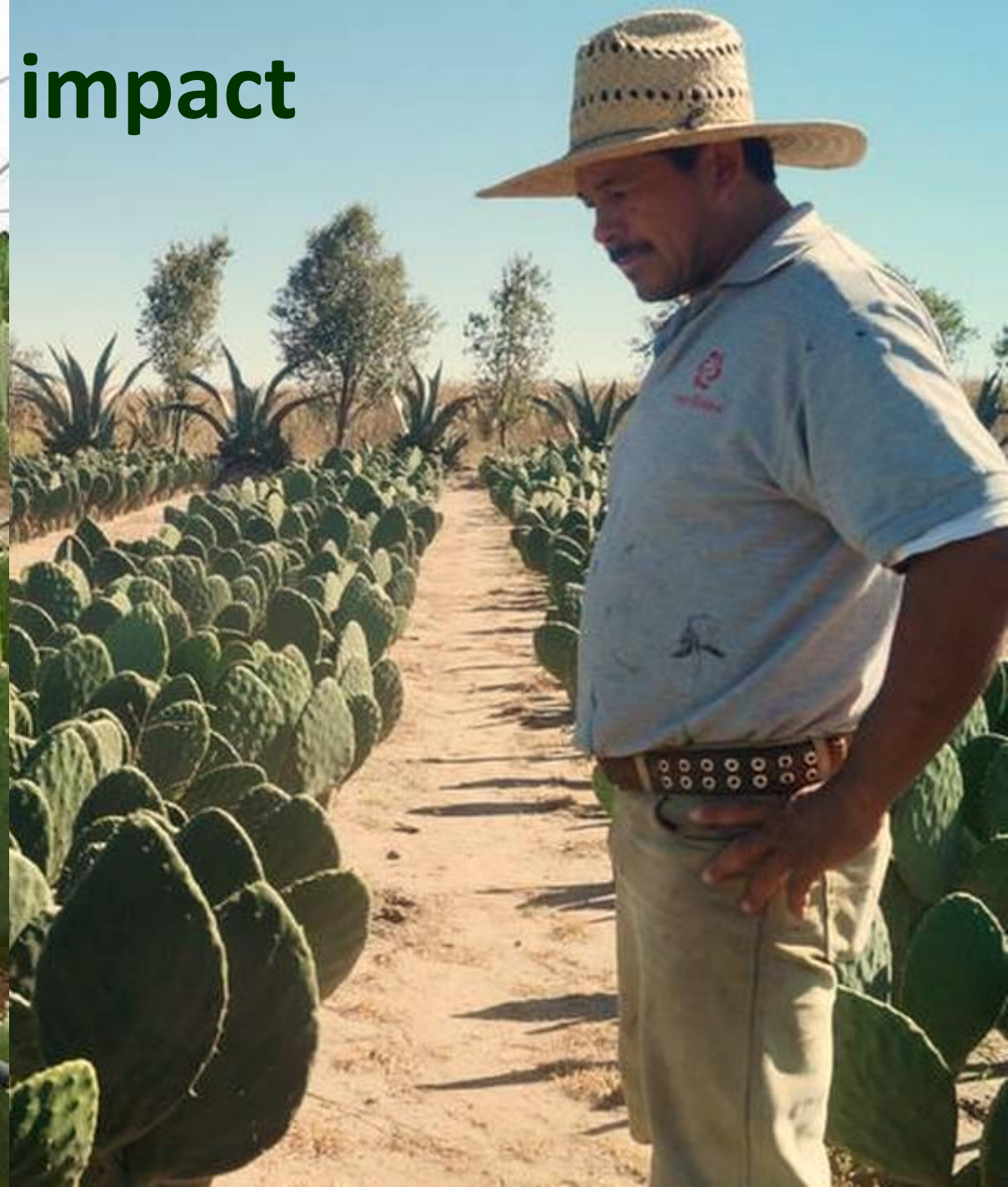
INVESTMENT IN RESEARCH

We are HERE!!!



Pellets of cactus bioplastic

Social impact



Biodegradable plastic from Prickly Pear Cactus

POLLUTION & WASTE > BIO-REMEDIATION



ID 10785

Owner Unknown

Type Technology

Source User uploads

Published Jul 29, 2020

Updated Aug 27, 2020

Description Benefits Other Information

[Log in for access to additional information and attachments](#)

Technology type Process, Material

Developed in Mexico

Deployed in Mexico

DEVELOPMENT STATUS

Readiness level (TRL) Technology development / prototype (TRL 5-6)

SE SECRETARÍA DE ECONOMÍA

IMPI INSTITUTO MEXICANO DE LA PROPIEDAD INDUSTRIAL

El Instituto Mexicano de la Propiedad Industrial, otorga el 1er. Premio IMPI a la invención Mexicana en la categoría **Tecnología Verde** por la patente de **Bioplástico de Nopal** a la Dra. Sandra Pascoe



Forbes

CNN
EN ESPAÑOL

Contenido
Para que tengas tema

BBC
NEWS

AFP

MUY
INTERESANTE



ありがとうございました

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